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ABSTRACT

A cost-effective, computer-based, Navy-related basic reading skills program was developed for United States Navy recruits reading below sixth grade level. The program, called Performance-Related Enabling Skills Training (PREST), is designed to enable recruits to improve their reading and study skills and, thereby, increase the probability of their successful completion of recruit training. The cost-effectiveness of this program is significant in light of current escalating instructor-related costs and the increasing need to accommodate greater numbers of recruits. (Author/MKM)

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A COMPUTER-PASED APPROACH TO FUNCTIONAL LITERACY TRAINING FOR RECRUITS: PERFORMANCE-RELATED ENABLING SKILLS TRAINING (PREST)

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In today's post-draft era, more and more recruits are entering the military services without the reading skills needed to successfully complete their basic training. All indications are that even more individuals entering the service will need some kind of remedial reading training. At the same time, instructor costs are going up. As a result, cost-effective methods are needed to be able to remediate more recruits, faster, and without the use of additional personnel. In an attempt to solve this problem, a model curriculum of job-related basic reading instruction for Navy recruits which utilizes a computer-based management and instructional system is now being developed.

Current Treatment

Since 1943, the Navy has provided a number of systematic programs of reading instruction for recruits deficient in literacy skills needed for successful completion of training (Fletcher, 1977; Duffy, 1977; and Smith, 1980). These programs were usually developed in response to a manpower shortage and abandoned whenever manpower needs decreased.

Academic Remedial Training

The Navy's current program, referred to as the Academic Remedial Training program, or ART, evolved from a program begun in the 1960's in response to the manpower needs of the Vietnam conflict and the Department of Defense's commitment to accept and train "marginal personnel" in all three of its services (Fletcher, 1977, p. 22).

Selection Process. Currently, the reading ability of Navy enlistees is not tested prior to their arrival at basic training.[1] However, recruits

[1] The Navy is now studying at three sites a program to identify and remediate reading skills prior to induction.

are given a reading evaluation as a regular part of in-processing as soon as they reach the Recruit Training Command to which they are assigned. Evaluation is carried out by means of the Gates-MacGinitie Reading Test, Level D. Figure 1, Recruit Selection for ART, delineates this process. Those who score less than 6.0 RGL on the Gates-MacGinitie are retested. Those who score 4.0 to 5.9 RGL on the retest are sent to the ART for remedial reading and study skills instruction. Those who score less than 4.0 RGL on the retest are referred to the Academic Review Board (ARB). The ARB may recommend dismissal from the Navy or, if the recruit displays high motivation and potential for reading improvement and if there is room in the remedial reading unit, the recruit may be referred to the ART. Those who score 6.0 or above continue with the regular recruit training program.[2] However, the ARB may refer individuals back to the ART at a later date if they fail any of the four academic tests which are given during recruit training.

Instructors. ART instructors are primarily Navy personnel, although some civilian instructors are used at each site. Enlisted instructors are typically college graduates who have had some background in education before enlistment and who volunteer for this assignment at the end of their own recruit training programs. Their tasks include filling out individual assignment sheets, checking assignments completed, conducting small group instruction, and administering tests. Directly or indirectly, they also serve as role models, work on student motivation, and function as a primary source of information on Navy life for the recruits in their classes.

[2] As of March 1980, a recommendation from the Naval Education and Training Command (CNET) has given the Technical Training Officer at each Recruit Training Command the perogative to send recruits 6.0 and above to the ART if there are places available.

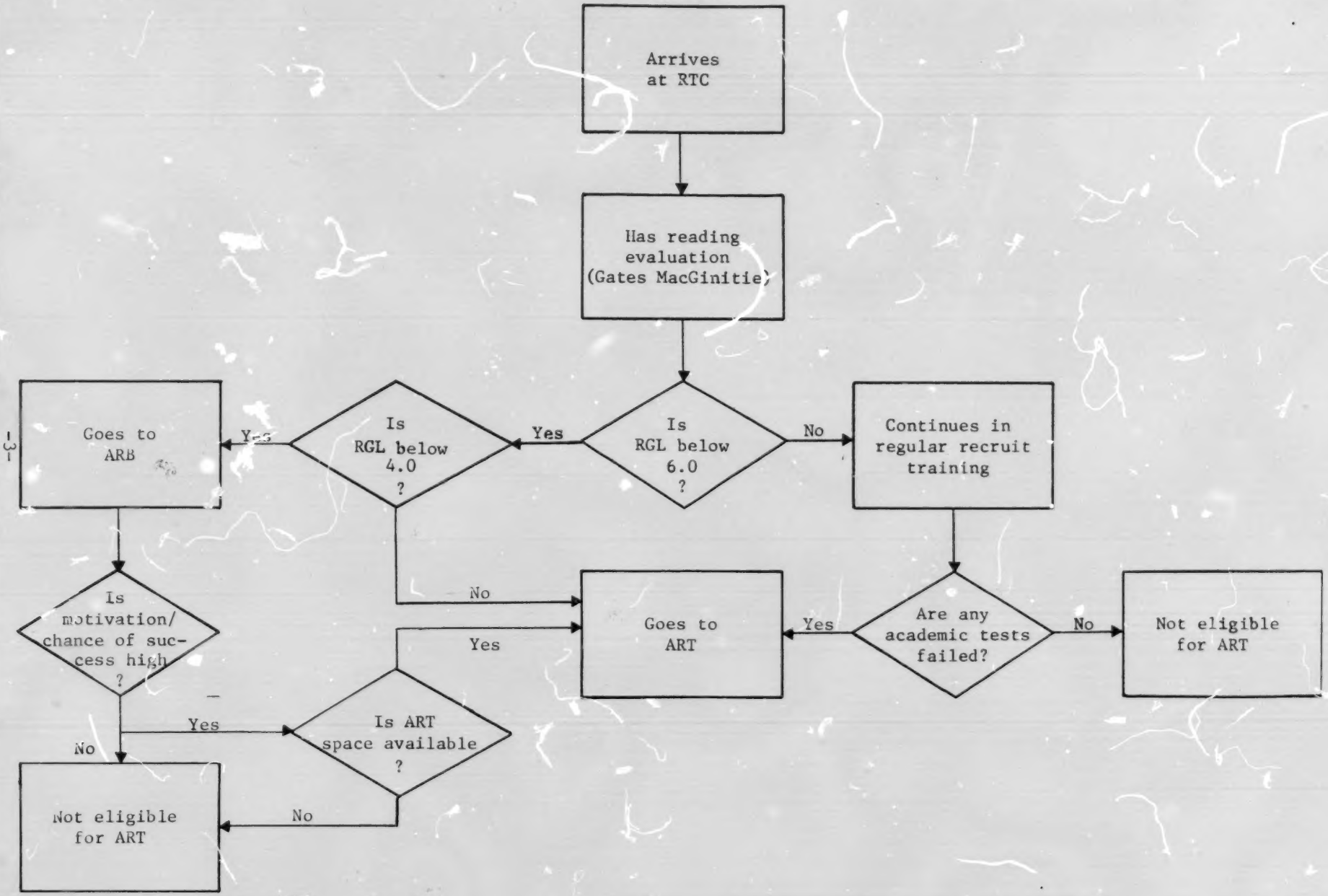

Figure 1. Recruit Selection for ART

Skill Areas. The current ART curriculum is based on mastery of objectives in the areas of reading and study skills. Figure 2, Current ART Skills Areas, displays these areas.

Upon entrance into the ART, recruits are given the Stanford Diagnostic Reading Test (SDRT), Brown Level. The areas evaluated by this test correspond to the skill areas of the ART since the ART skill areas "were derived from the objectives and content of the SDRT, Brown Level" (CNTECHTRA, 1979, p. 7).

Results are analyzed by feeding the SDRT answer sheets through an OpSCAN device which identifies all correct and incorrect answers. These results are then put into the general Navy training CMI system via an input/output device linked to a mainframe computer in Millington, Tennessee. The Millington computer responds with an individualized prescription which is printed on the same input/output device.

The instructor uses this prescription to fill out an assignment sheet by selecting materials from lists corresponding to each possible objective. The recruit attends some small group instruction on assigned objectives and completes all activities listed on his or her assignment sheet.

Assigned materials are primarily commercial materials commonly found in the traditional school classroom or remediation center, e.g., a large collection of SRA kits, and the Boning Specific Skills and Multiple Skills Series. Study skills materials include Nila Banton Smith's Be a Better Reader, SRA's How to Study, and many other similar

- Phonetic Analysis
  - Consonant Sounds
    - Single Consonants
    - Consonant Clusters
    - Digraphs
  - Vowel Sounds
    - Short Vowels
    - Long Vowels
    - Diphthongs
- Structural Analysis
  - Word Division
    - Compounds
    - Affixes
    - Open and Closed Syllables
  - Blending
    - Affixes
    - Syllables
- Auditory Vocabulary
  - Reading
  - Mathematics and Science
  - Social Studies
- Reading Comprehension
  - Literal
  - Inferential
- Reading Rate
- SQ3R
  - Reading
  - Underlining and Outlining
  - Skimming
  - Scanning
- Notetaking and Testtaking
  - Outlining Lecture
  - Studying for and Taking Tests

Figure 2. Current ART Skill Areas

materials, including commercial cassette tapes for instruction in listening skills. In addition, the existing ART curriculum has recently incorporated a Navy job-related remedial reading workbook, Improving Your Navy Reading Skills, to supplement their materials offering (Curry & Kincaid, 1980).

Criteria for Completion. Recruits must display a specified minimum competency on a mastery test for each skill area originally prescribed, based on SDRT data.

Recruits attend classes from 0830 to 1100 and from 1230 to 1500, five days a week. Average completion time for recruits entering the program at a 4.0 to 5.9 RGL, as measured by the Gates-MacGinitie, is between four and six weeks.

Experimental Treatment

The current Academic Remedial Training program is effective, but it is becoming too costly in terms of the student/instructor ratio which it requires because of the greater numbers of recruits to be accomodated and the increasing instructor costs. Computer-based instruction, developed and tested since the early 1960s, offers a cost-effective alternative to meet the Navy's recruit reading instruction needs.

PREST Curriculum

In order to meet the specific recruit-literacy development needs of the U. S. Navy, Research for Better Schools, Inc. (RBS) has developed a computer-based job-related and study skills curriculum for

recruits who enter the service reading at less than a sixth-grade level. The curriculum has been named PREST (Performance-Related Enabling Skills Training) in order to emphasize its focus on the development of Navy functional literacy skills. A computer-based curriculum was chosen because it appears to offer the best hope for flexible and cost-effective delivery of a quality reading program to large numbers of recruits.

The objectives of the project are:

- to provide Navy recruits with basic reading and study skills necessary for their successful completion of recruit training
- to provide Navy recruits with a Navy-related curriculum that will increase the probability of their successful completion of recruit training
- to enable Navy recruits reading below 6.0 RGL to achieve at least a 6.0 RGL on the Gates-MacGinitie Reading Test, Level D

The PREST curriculum is based on objectives which are closely tied to the specific literacy requirements of recruit training and uses materials which are based on content which is Navy specific. It is hoped that, in this way, time will not be lost developing skills which are not necessary to successful completion of recruit training, e.g., ability to correctly mark long and short vowel sounds. Materials used to teach reading and study skills will at the same time increase the recruits' knowledge of materials which must be learned later in recruit training.

Like the current ART curriculum, PREST is based upon mastery of specific objectives. The entire curriculum consists of 107 objectives in each of six skill areas, called strands. Each strand is divided into clusters. Each cluster is comprised of all instructional, drill and practice, and evaluation activities pertaining to one specific objective. (See Figure 3, PREST Skill Areas.)

Word Analysis

Vocabulary Development

Literal Comprehension

Interpretive Comprehension

Evaluative Comprehension

Study Skills

- **Previewing**
- **Scanning for Information**
- **Notetaking**
- **Listening**
- **Reviewing**
- **Taking Tests**

Figure 3. PREST Skill Areas

Components. The reading component of PREST consists of a modified version of Control Data Corporation's (CDC's) Basic Skills Learning System (BSLS), a computer-based instructional program designed for use with adults reading below the eighth-grade level and delivered via CDC's PLATO® terminal. The reading component of BSLS consists of five strands, one to represent each of the five major reading skills: structural analysis, vocabulary development, literal comprehension, interpretive comprehension, and evaluative comprehension.

- Word Analysis introduces the basic concepts involved in the structure of words. In this module, the student examines simple word building, prefixes, suffixes, and compound words. (23 objectives, 43 hours of instruction available)

- Vocabulary Development introduces the basic concepts involved in vocabulary development as a basis for comprehension. In this module, the student examines comparatives, pronouns, and prepositions in context; homonyms, homophones, and homographs in context; synonyms; group and member; cause and effect; and idioms. (24 objectives, 45 hours of instruction available)

- Literal Comprehension introduces the basic concepts involved in literal comprehension of written material. In this module, the student examines methods of locating basic facts and understanding, remembering, and interpreting what is read. (27 objectives, 50 hours of instruction available)

- Interpretive Comprehension introduces the basic concepts involved in interpretation of written material. In this module, the student examines techniques for interpreting facts, descriptions, conclusions, and the total theme. (22 objectives, 40 hours of instruction available)

- Evaluative Comprehension introduces the basic concepts involved in the evaluation of written materials. In this module, the student examines techniques for determining the differences between fact and nonfact and the purpose of the author, evaluating what is read, and separating facts from opinions. (15 objectives, 29 hours of instruction available)

This particular program was chosen because it has been proven effective for use with adult populations (in adult learning centers, public schools, and correctional institutions) and because its objectives correlate well with those established for use in the remedial reading instruction of Navy recruits. In the BSLS reading almost all objectives which are not relevant to recruit literacy needs were eliminated in the PREST version. Those remaining were left as part of a trade-off in management simplification.

The study skills component was developed as a totally new strand. It follows the conventions of the existing BSLS program. All objectives have been chosen with Navy recruit training needs in mind. All content used for instruction, drill and practice, and testing comes from the Basic Military Requirements and The Bluejackets' Manual, the two manuals which recruits use during recruit training, and the Instructor Guides, which provide the content to be covered in each recruit training lecture.

Management System. Figure 4 delineates the management system of PREST. All functions and activities in the center and right sections of the diagram are handled on-line (as shown by the heavy black line). Broken-line boxes indicate the main steps in a recruit's progress through PREST. Off-line activities are shown in the left section of the diagram.

A recruit entering the PREST curriculum receives on-line orientation to the PLATO terminal and to the purpose and structure of PREST. The recruit then moves into a diagnostic screening (by means of the BSLS Reading Inventory) which leads to automatic placement in the appropriate section of the curriculum.

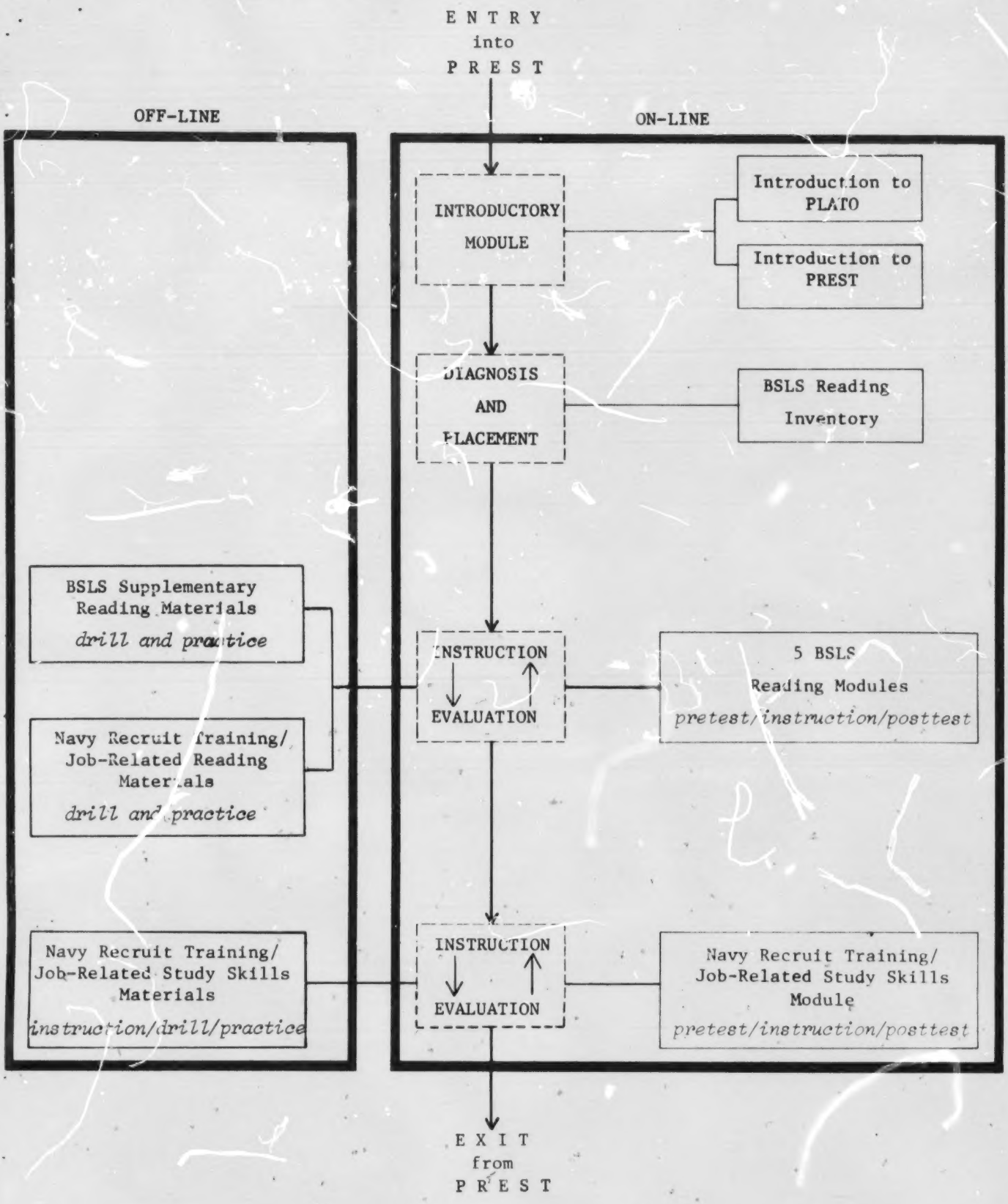

Figure 4. PREST Management System

Upon entering the inventory for the first time, the recruit is tested on mastery of skills in the first area of the curriculum, word analysis. As soon as the recruit can no longer demonstrate mastery, (s)he is placed into the word analysis curriculum associated with that objective. The recruit has a second chance to demonstrate mastery by choosing to take a pretest on that objective. Other options are going into a tutorial, doing drill and practice, or working with off-line materials. If the recruit passes the pretest, (s)he is given the same options for the next objective. If the pretest is not passed, one of the other activity options must be chosen and a mastery test must be passed before the recruit moves on to the next objective. When a student has demonstrated mastery on the first half of the objectives in any skill area, (s)he has the option of going into the inventory for the next area.

PREST is designed for use by groups of one instructor for 24 recruits utilizing 12 PLATO V terminals. The PREST instructor functions as a resource, circulating among the recruits to provide spot assistance and to conduct small-group supplementary sessions when needed. Small-group instruction time is also used to provide recruits with additional Navy-related information which will contribute to their success when they return to regular recruit training.

All recordkeeping and management of recruit progress is handled by the computer, and this information is readily available on-line for review by the instructor or other authorized personnel. (See Figures 5 and 6 for example progress records.)

PREST

Profile of progress for student

a. Making New Words (Ø clusters done.) INV

b. Understanding New Words (Ø clusters done.) INV

c. Understanding What you Read (Ø clusters done.) INV

d. Thinking About What You Read (Ø clusters done.) INV

e. Judging What You Read (Ø clusters done) INV

f. Study Skills (Ø clusters done.) INV

Press a SHIFTED letter for bundle information.
Press an unshifted letter for cluster information.

□ = not yet done ▨ = passed by inventory
▨ = passed by pretest ▨ = passed by mastery
▨ = currently in progress ▨ = instructor advance
▨ = instructor regression DATA for other symbols

SHIFT-NEXT → next student SHIFT-BACK → previous student
BACK → other options HELP → explanation of profile
LAB → see student's times NEXT → next curriculum

Figure 5. Recruit Progress Record

Student name: " "

Date	Time	Curr	Str	Cl	Activity	Pass	Mins
3/28/88	12:26	-----	0	1	introduction	Pass	1
	12:28	-----	0	2	introduction	Pass	13
	12:41	-----	0	3	introduction	Pass	15
	12:58	PREST	1	5	inventory	Place	15
	13:13	PREST	1	5	pretest	Pass	3
	13:20	PREST	1	6	pretest	Pass	4
	13:27	PREST	1	7	pretest	Pass	4
	13:31	PREST	1	7	review check	Pass	3
	13:40	PREST	1	8	pretest	Fail	9
	13:51	PREST	1	8	tutorial	Pass	21
	14:12	PREST	1	8	progress check	Pass	4
	14:16	PREST	1	8	pretest	Fail	4
	14:23	PREST	1	9	tutorial	Left	7

=====End of Data=====

+ → newer data BACK → options SHIFT-NEXT → next student
- → older data LAB → profile SHIFT-BACK → last student

Figure 6. Recruit Progress with Time Reference

Formative Evaluation

The RBS evaluation activities are formative in nature and designed to provide information on the progress of recruits and problems identified during tryout testing at Great Lakes Naval Training Center (NTC) during October and November, 1979 and prepilot testing at Orlando NTC during January and February, 1980. This information has been used in the revision and refinement of PREST.

Outcomes of Prepilot

As a result of the formative evaluation activities, changes were made in the following areas: selection of objectives to be included, extent and nature of information provided by instructions, length of instruction time, extent and use of off-line materials, and general management procedures.

Objectives Included. Initially, all clusters were eliminated which were based on objectives not germane to Navy recruit training, e.g., Strand Four, Cluster 21, Forming and Identifying Similes. However, during the prepilot some of these clusters were restored to the curriculum because their being included presented less difficulty than the instructor intervention required for their elimination.

Extent and Nature of Instructor Intervention. Although the on-line materials are generally self-instructional, instructor intervention was found necessary at two specific points. The general introduction to the use of the PLATO keyboard does not teach how to type an apostrophe; this skill is necessary for Strand One, Cluster 3. If the recruit doesn't

get this information from the instructor before beginning the BSLS Inventory, (s)he will fail the inventory test on that objective and be placed in the curriculum at that level, even though contraction formation was a previously mastered skill. Also, in the cluster on comparatives, the tutorial teaches -er and -est, but the mastery testing also requires knowledge of the irregular form of the comparison good, better, and best as well as the non-inflected forms of important, more important, and most important. The instructor was, therefore, told to intervene with instruction on these forms before the mastery test was undertaken.

It was also found that the instructors needed a uniform strategy for assisting recruits in the decoding of unknown words. The only decoding strategies taught directly in the BSLS reading curriculum are the recognition of inflectional endings, affixes, and elements of compound words. The instructors had taught phonetic analysis in the present ART curriculum, which uses an approach based upon the recitation and application of commonly taught phonetic "rules", e.g., rules for long and short vowel sounds. It was felt that use of this method would introduce unnecessary complications in that these rules were not taught on line; they required a degree of abstraction which was difficult for many of the recruits in the program; and, perhaps worst of all, they evoked in many of the recruits memories of past failures. Therefore, instructors were told to assist recruits in identifying unknown words by helping them to identify known word patterns, e.g., recognizing the familiar grapheme clusters in con-tam-in-a-tion. This method was supplemented when necessary by

ad hoc information on sound/symbol correspondence, e.g., ph = f, or c stands for either s or k. This approach seems adequate. Perhaps because recruits were taught to take words apart in the word analysis area of the curriculum, this method reinforced the analysis techniques they were learning on line; perhaps they got enough practice using this technique since they are constantly bombarded by print while working on line; or perhaps the words being taught had enough meaning to provide memory assist. It was originally thought a specific decoding component would be necessary for the curriculum; however, the recruits learned to function quite well using this technique.

In general, however, instructor intervention primarily took the form of encouragement, motivation, discussion of the place of reading in the recruits' future in the Navy, and provision of information about what to expect upon return to regular recruit training.

Length of Instruction Time. The PREST instructional day initially followed the same schedule as the regular ART curriculum, 0830 to 1045 and 1230 to 1445, with a ten-minute break mid-session both morning and afternoon. During the first week of the prepilot, PREST recruits were asked to report one-half hour before the recruits in the regular program. The PREST recruits accepted this change willingly since they seemed to realize that the more time they put in, the faster they would be able to return to regular recruit training. In fact, it became increasingly difficult to make them take a mid-session break. Rarely did anyone take a full ten minutes and the instructors were compelled to require that everyone

sign off and stand up at mid-session. Furthermore, the recruits consistently signed on a few minutes before 0800 and returned from lunch to sign back on at 1215 instead of 1230. By the end of the prepilot, it was ascertained that a fatigue factor was not present by 1445, so the PREST instruction day was extended to 1530. This presented no scheduling problem since the 1500 to 1530 period in the ART recruit's day had been previously allocated as a "homework" period.

Extent and Use of Off-Line Materials. During the first weeks of the prepilot, a variety of materials, including the CDC off-line materials, Navy-related materials specially designed for PREST to provide additional practice in reading and study skills taught on line, and a few of the materials currently being used in the ART program, i.e., Improving Your Navy Reading Skills and Chapter Five ("Listening") from How to Study were used in varying combination and for a variety of purposes. Based on observation of the prepilot, usage of these materials was finalized.

General Management Procedures. A variety of management procedures were also tried and, based on prepilot observations, management procedures were formalized and provided for the instructors as part of an Instructor's Manual.

In summary, most of the recruits were very positive in their remarks regarding PREST. The facts that they tended to come early, stay late, and resist taking breaks further indicate a positive response. Both instructors involved with the project seemed to enjoy their role in PREST. They were active in their interactions with the recruits and with the PLATO terminal. They openly acknowledge the benefits to the recruits of their changed role and their ability to spend more time working with individual recruits.

Summative Evaluation

The formative evaluation is complemented by a summative evaluation of program effects which is being conducted by the Naval Personnel Research and Development Center (NPRDC). The summative evaluation includes a control group of 60-80 recruits and an experimental group of a similar size. The control recruits were drawn from the October 1979 through January 1980 ART students. Experimental participants were drawn from the same population, but during the February through April 1980 period.

In addition to background data, three sets of instruments were selected to measure the three areas of evaluation emphasis: instructional effectiveness, cost effectiveness, and longer-term recruit training success. These measures were as follows:

Background (pre-only)
- Background Information Sheet
- Armed Services Vocational Aptitude Battery

Instructional Effectiveness (pre-post)
- Gates MacGinitie, Survey D 1965 Comprehension
- Navy Recruit Reading Test
- Navy Recruit Attitude Scale (RBS)

Cost Effectiveness
- Comparison of instructional gains in RGL, divided by time in program

Recruit Training Success
- Recruit Academic Tests
- Completion of Recruit Training

Analyses comparing the ART control and PREST experimental groups will be performed in each area of emphasis.

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